- Look at data, test fit to some reasonable distribution on a per decade bases (Hint hurricanes are rare).
  https://en.wikipedia.org/wiki/List_of_Category_4_Atlantic_hurricanes
  https://en.wikipedia.org/wiki/List_of_Category_5_Atlantic_hurricanes

1- Poisson Distribution: For List Category #4 the number of hurricanes for each decade starting from 1848 till 2018 and counting the hurricanes per decade we had the following vector (17 records and 121 count in total):

harr.cat4.vec <- c (2,2,1,4,3,3,5,6,10,9,14,11,4,7,8,19,13)

Calculating the λ for the above vector by hand or using

fitdistr (harr.cat4.vec, "poisson")

We will have λ=7.12 as a result.

harr.cat4.m<-mean(harr.cat4.vec)

After that generating the probability sequence using

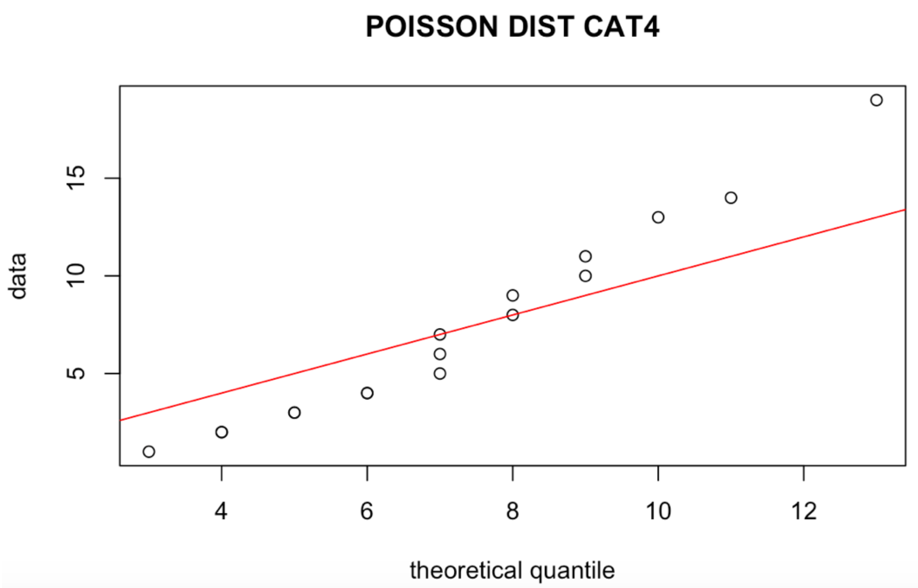
p<-ppoints(harr.cat4.vec)

q<-qpois (p, harr.cat4.m)

[0.029, 0.088, 0.147, 0.206, 0.265, 0.324, 0.382, 0.441, 0.500, 0.5590, .618, 0.676, 0.735, 0.794, 0.853, 0.912, 0.971]

Using the Quantile Quantile plot we fit the data and have the following plot:

plot (q, sort(harr.cat4.vec),xlab="theoretical quantile",ylab="data",main="POISSON DIST CAT4")



2- Poisson Distribution: For List Category #5 the number of hurricanes for each decade starting from 1919 till 2019 and counting the hurricanes per decade we had the following vector (10 records and 35 count in total):

harr.cat5.vec <- c (2,6,0,2,4,3,3,2,8,5)

Calculating the λ for the above vector by hand or using

fitdistr (harr.cat5.vec, "poisson")

we will have λ=3.5 as a result.

harr.cat5.m<-mean(harr.cat5.vec)

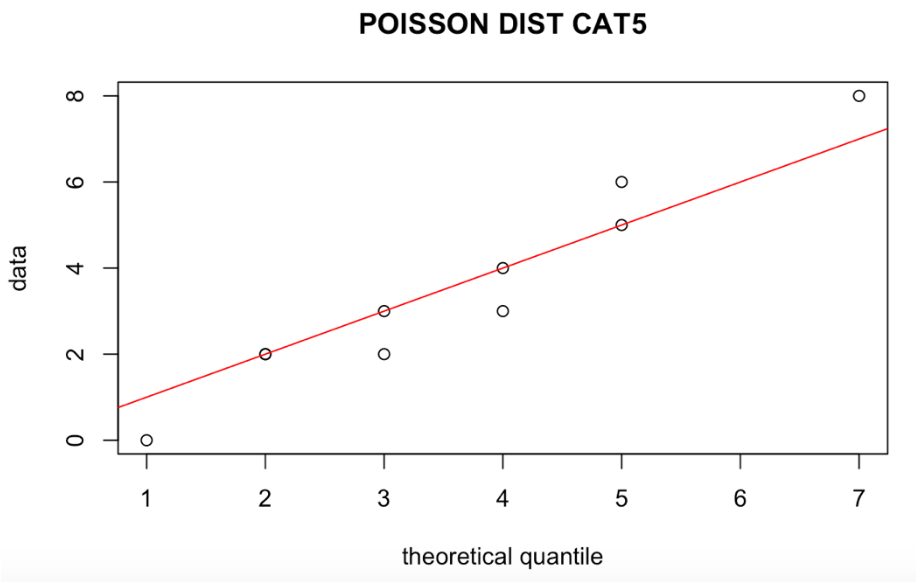
After that generating the probability sequence using

p<-ppoints(harr.cat5.vec)

q<-qpois (p, harr.cat5.m)

Using the Quantile Quantile plot we fit the data and have the following plot:

plot (q, sort(harr.cat5.vec), xlab="theoretical quantile",ylab="data",main="POISSON DIST")



And as I found the Poisson isn't fitting the data perfectly, I also tried the negative binomial distribution and binomial distribution with the following steps:

3- Negative Binomial Distribution: For List Category #4 the number of hurricanes for each decade starting from 1848 till 2018 and counting the hurricanes per decade we had the following vector (17 records and 121 count in total):

harr.cat4.vec <- c (2,2,1,4,3,3,5,6,10,9,14,11,4,7,8,19,13)

Calculating the parameters for the above vector by hand or using

fitdistr (harr.cat4.vec, "Negative Binomial")

We will have mu=7.1 and size=3

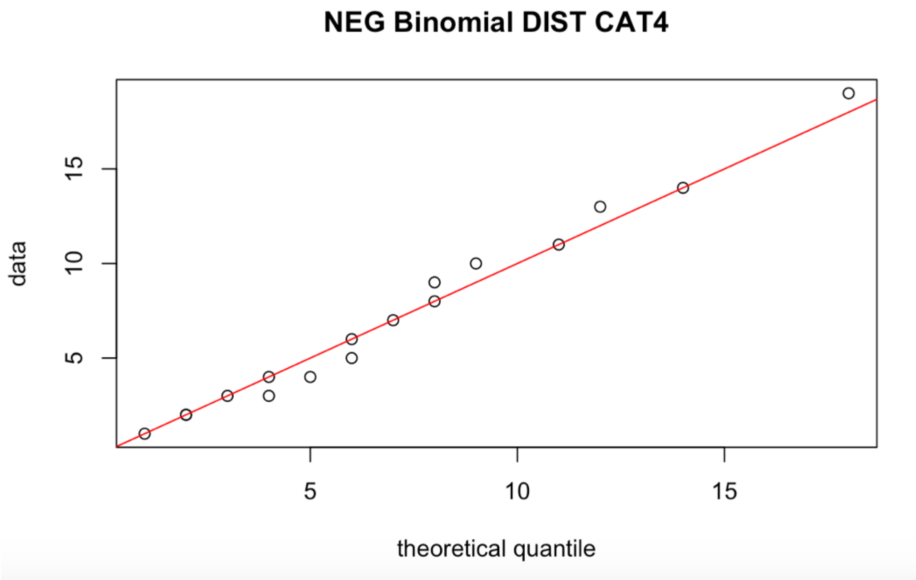
After that generating the probability sequence using

p<-ppoints(harr.cat4.vec)

q<- qnbinom(ppoints(harr.cat4.vec), size=3, mu=7.1)

Using the Quantile Quantile plot we fit the data and have the following plot:

plot (q, sort(data),xlab="theoretical quantile",ylab="data",main="NEG BINOM CAT4")

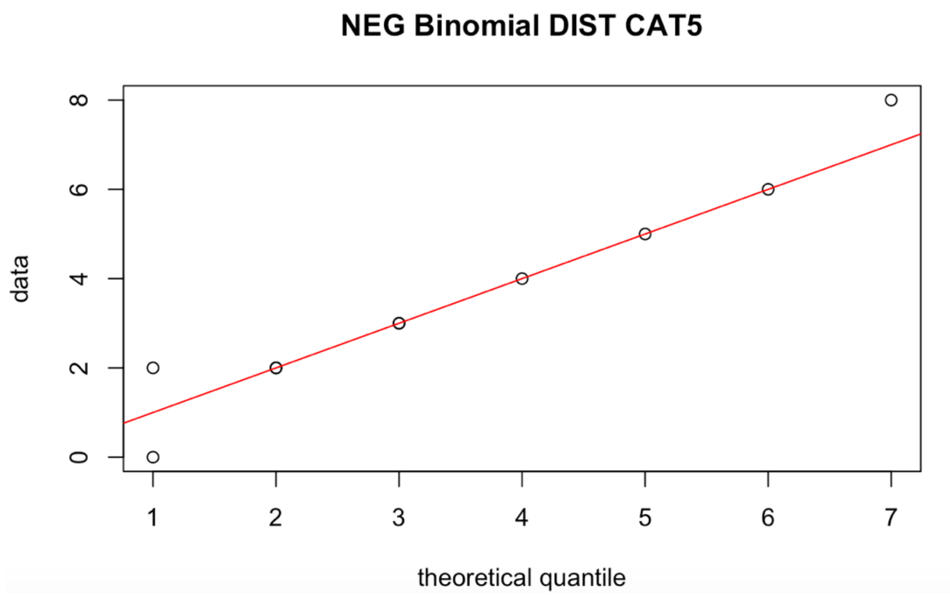


4- Negative Binomial Distribution: For List Category #5

harr.cat5.vec <- c (2,6,0,2,4,3,3,2,8,5)

with the parameters mu=3.50 and size = 8.25

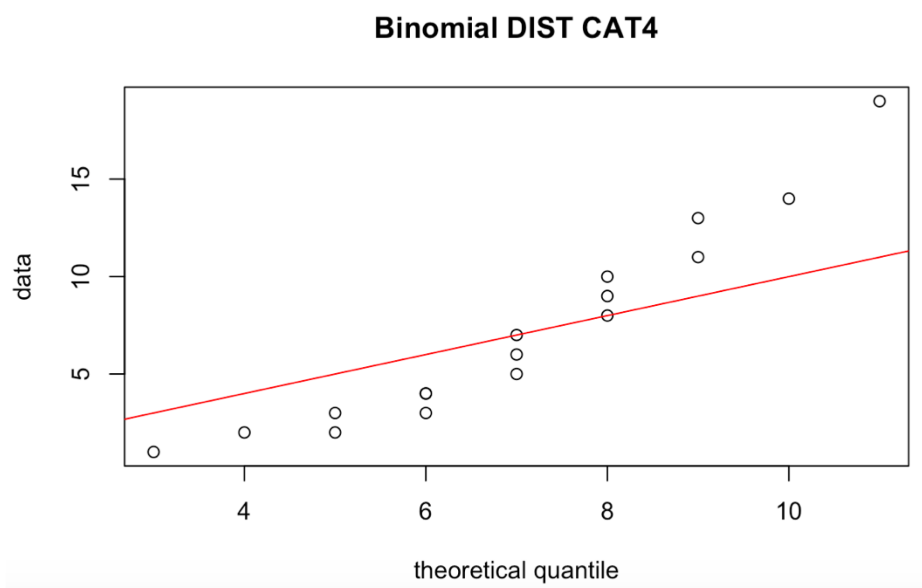
plot(q sort(harr.cat5.vec),xlab="theoretical quantile",ylab="data",main="NEG Binomial DIST CAT5")

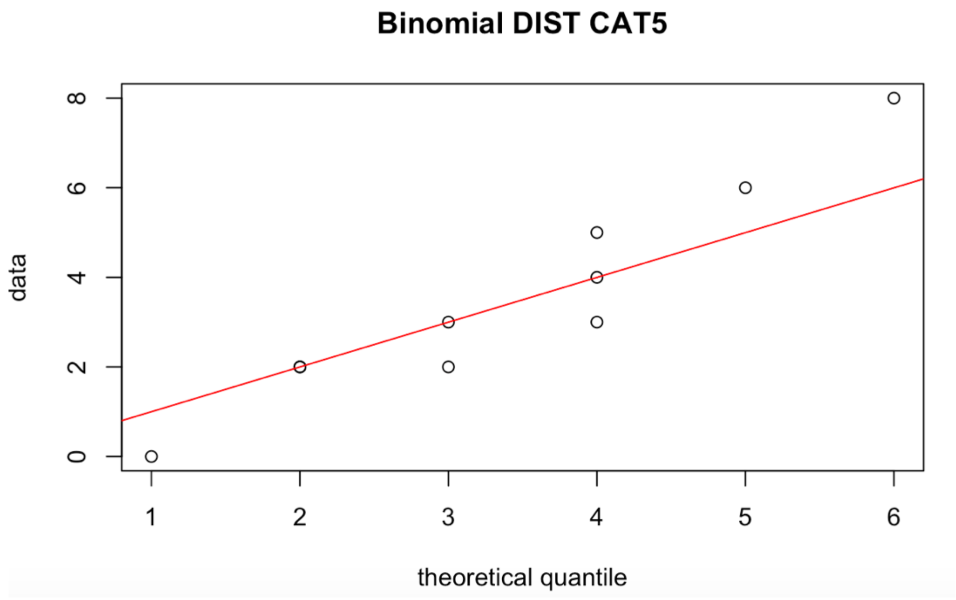


5- Using Binomial Distribution with Category #4 and Category #5

qbinom(p,17,mean(harr.cat4.vec /17))

qbinom(p2,15,mean(harr.cat5.vec /10))





Based on the above work I find the negative binomial distribution is best fit for these records.

On the other research I read some information about how NASA study hurricanes
https://pmm.nasa.gov/articles/how-does-nasa-study-hurricanes

Some interesting data is also being collected here :
https://www.data.gov/disasters/hurricanes/